

REMARKS

Claims 1-7, 18-21 and 23 are all the claims pending in the application.

In response to the Amendment filed June 13, 2003, the Examiner removed all of the previous claim rejections, except the prior art rejection of claims 18-21. The status of the claims is as follows.

Claims 1-7 and 23 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter, which the Applicant regards as the invention, and as being incomplete for omitting essential elements.

Claim 5 is further rejected as allegedly being indefinite due to its recitation of “the first concave portion,” which lacks proper antecedent basis.

Claims 18 and 19 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over previously-cited Kawai (US 6,239,033). Claims 20 and 21 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kawai in view of previously-cited Fujihara et al. (US 6,108,361).

With respect to the rejections under § 112, second paragraph, the Examiner contends that the claims omit essential features. Claims 1 and 23 are amended to include a recitation of an active layer, as suggested by the Examiner.

Additionally, claims 1, 2, and 4 are amended to correct the antecedent basis problem in claim 5, by reciting the “first concave portion.”

Therefore, Applicant submits that claims 1-7 and 23, as amended, are allowable.

In the present Amendment, claims 18 and 19 are canceled, and claim 20 is rewritten in independent form including the limitations of claims 18 and 19.

Applicant submits that the features of claim 20 are not taught or suggested by the applied references. In particular, Fujihara et al. do not disclose a heat sink connected to the flattened surface having the groove. Instead, Fujihara et al. disclose a heat sink 513 (FIG. 7) connected to a surface at an opposite end of the device from the surface having the groove. The surface having the groove is connected to a contact block 527 instead of the heat sink 513. Therefore, claim 20 and its dependent claim 21 are allowable over the prior art.

With further regard to the rejection of original claims 18 and 19, the limitations of which are now present in claim 20, Applicant has the following comments.

The Examiner alleges that it would have been obvious to one having ordinary skill in the art at the time of the invention to make the substrate of GaN and the semiconductor layer with a GaN base, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. Applicant submits that the use of GaN or sapphire as a substrate is not merely a matter of design choice.

In particular, sapphire is harder, more chemically stable, and provides better heat dissipation than GaN, making the manufacture of semiconductors on sapphire substrates easier than on GaN substrate. In fact, the invention of Kawai is directed to semiconductor devices that use sapphire substrates. Kawai seeks to overcome problems in these devices, such as reduced high frequency operation and high-power output, that plagued semiconductors formed on sapphire substrates (Kawai, column 3, lines 26-43). Based on the particular focus of Kawai on semiconductors having sapphire substrates, the arrangement would not necessarily be suitable with a different substrate, such as GaN. In other words, the reference does not support a position

that sapphire substrates and GaN substrates are interchangeable for any semiconductor use, and therefore, use of GaN in the present invention is not merely a design choice.

Furthermore, using a sapphire substrate in conjunction with GaN semiconductor layers (such as what Kawai discloses) inherently has other problems, as the difference in lattice constant that occurs between the sapphire substrate and the GaN layer results in a substantial number of surface dislocations in the GaN layer. In spite of this, and because of sapphire's strength and heat characteristics, conventional semiconductors such as those of Kawai continue to use sapphire substrates.

Applicant's invention using a GaN substrate avoids the lattice constant difference present with sapphire substrates, but is able to provide improved heat dissipation through the unique formation of the semiconductor layers and the formation of the groove therein. Therefore, the selection of the materials is not merely a matter of design choice, but provides an important structural and functional difference.

The Examiner refers to the Morita et al. (US 2001/0048114) and Takatani (US 6,597,716) references in the "Response to Arguments" as allegedly disclosing lasers having GaN based semiconductor layers formed on a GaN substrate to support his obvious design choice contention. However, the Examiner still has not provided a convincing line of argument as to why one of ordinary skill in the art would have been motivated to make the asserted modification of Kawai of replacing the sapphire substrate with a GaN substrate, especially in light of the structural and functional difference between these types of substrates.

Therefore, claims 20 and 21 are allowable over the prior art for this additional reason.

AMENDMENT UNDER 37 C.F.R. § 1.111
U. S. Application No. 09/826,851

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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